

## REMARKS

### 1. Summary of the Office Action

In the Office Action mailed July 11, 2006, the Examiner rejected claims 1-9, 11, and 16-18 under 35 U.S.C. § 103(a) as being allegedly unpatentable over U.S. Patent No. 6,212,783 (Ott) in view of U.S. Patent No. 5,659,249 (Kawamoto). Further, the Examiner rejected claim 10 under 35 U.S.C. § 103(a) as being allegedly unpatentable over Ott in view of Kawamoto and further in view of Applicants' "admitted prior art".

### 2. Status of the Amendments

On page 9, lines 3-4, Applicants' specification referred to U.S. Patent No. 4,487,584. By this response, Applicants have amended page 9 of the specification to correct a typographical error. Applicants' specification, as amended, now refers to U.S. Patent No. 4,847,584.

Further, Applicants have amended independent claims 1, 11, and 16 to include the subject matter of dependent claim 10. In addition, Applicants have amended dependent claims 5, 6, and 9 to reflect proper antecedent basis from each of independent claims 1, 11, and 16. Now pending in this application are claims 1-9, 11, and 16-18 of which claims 1, 11, and 16 are independent.

### 3. Summary of Claimed Invention

Applicants' presently claimed invention is generally directed to a 360-degree magnetoresistive rotary position sensor that uses a magnetoresistive linear sensor and a magnetoresistive angular sensor, in which both sensors are formed on a semiconductor substrate. For example, as shown in Figure 1, position sensor 100 "includes a magnetic linear sensor 102 and a magnetic angular sensor 104 formed on a semiconductor substrate 130." See Applicants' specification at page 7, lines 6-7. Applicants' specification explains that "linear sensor 102 may include four magnetoresistive elements 14, 16, 18, and 20 composed of a ferromagnetic film

patterned as resistive strips 98 electrically connected in series on the semiconductor substrate 130." *Id.* at page 7, lines 10-13. And angular sensor 104 "may include eight magnetoresistive elements 103a-h." *Id.* at page 7, lines 16-17. According to Applicants' specification, the magnetoresistive elements 103a-h may "also be composed of a ferromagnetic film patterned as resistive strips electrically connected in series on the semiconductor substrate 130." *Id.* at page 7, lines 17-20.

In this regard, each of Applicants' independent claims 1, 11, and 16 recites a magnetoresistive linear sensor and magnetoresistive angular sensor in which the sensors are formed on a semiconductor substrate.

It should be understood that the preceding brief summary is intended to call attention to only certain aspects of Applicants' presently claimed invention that are relevant to the following discussion. Consequently, the summary should not be viewed as encompassing all aspects previously disclosed and/or claimed, or limiting the scope of Applicants' presently claimed invention in any new manner.

#### 4. Response to Examiner's Rejections of Claims 1-9, 11, and 16-18

As noted above, in the Office Action mailed July 11, 2006, the Examiner rejected claims 1-9, 11, and 16-18 as being allegedly unpatentable over Ott and Kawamoto. Applicants respectfully traverse the obviousness rejections for the following reasons:

##### a. Combination fails to teach every claimed element

Under M.P.E.P. § 2143, in order to establish a *prima facie* case of obviousness of a claim over a combination of references, the Office Action must establish that the combination discloses or suggests every element recited in the claim. Applicants respectfully traverse the obviousness rejection of these claims since the Office Action has not established that the combination of Ott

and Kawamoto teaches every element of independent claims 1, 11, and 16. In particular, the Office Action has not established that the combination of Ott and Kawamoto teaches a 360-degree rotary position sensor system using a magnetoresistive linear sensor and a magnetoresistive angular sensor, in which the sensors are formed on a semiconductor substrate.

Ott is directed to a non-contact system for detecting an angle of rotation using "two sensor elements IC1 and IC2, which are located on a substrate 16." See Ott at column 4, lines 8-9, title, and Figure 1. According to Ott, sensor element IC1 "includes a sensitive element which operates by utilizing the magnetoresistive effect to ascertain the angle between the magnetic field and the of [sic] rotation sensor." *Id.* at column 4, lines 11-14. Further, according to Ott, sensor element IC2 "contains the evaluation circuit A for the magnetoresistive element IC1 and additionally contains a sensitive unit that operates by the Hall effect." *Id.* at column 4, lines 21-22.

Ott teaches that the "chip IC1 with the magnetoresistive element and the chip IC2 with the evaluation circuit and the Hall element or Hall elements can be made separately by different production processes, [to] make effective production possible." *Id.* at column 5, lines 41-45. Further, Ott teaches that the "[t]he chips produced separately are connected to one another by conductor pins, which are bent at 90.degree." *Id.* at column 5, lines 48-49. Ott discloses that "[t]his creates an easily manipulated unit for further processing." *Id.* at column 5, lines 51-52. Further, Ott discloses that the "separation of the magnetoresistive element and the evaluation circuit and the connection with conductor pins enable optimal integration with the special integrated circuits IC1 and IC2." *Id.* at column 5, lines 52-54.

Applicants submit that Ott's non-contact system for detecting an angle of rotation using a magnetoresistive sensor (IC1) and a hall sensor (IC2) in which both sensor elements are made

separately by different production processes does not amount to Applicants' presently claimed invention of using a *magnetoresistive* linear sensor and a *magnetoresistive* angular sensor in which the magnetoresistive sensors are formed on a semiconductor substrate. (Emphasis added). Thus, Applicants submit that Ott fails to teach each of Applicants' independent claims 1, 11, and 16.

Further, Applicants submit that Kawamoto fails to make up for Ott's deficiency. On page 2, the Office Action asserted (without citing to any portion in Kawamoto) that "Kawamoto discloses a semiconductor magnetic-to-electric converter with Hall device where Hall device and signal processing circuit is formed on a semiconductor substrate resulting in one chip IC as a semiconductor magnetic-to-electric converter."

Applicants submit that the Office Action's assertion of Kawamoto's Hall device formed on a semiconductor substrate does not amount to Applicants' 360-degree rotary position sensor system using a *magnetoresistive* linear sensor and a *magnetoresistive* angular sensor in which the sensors are formed on a semiconductor substrate. Thus, Applicants submit that Kawamoto, in this regard, fails to make up for Ott's deficiency.

Because the combination of Ott and Kawamoto fails to teach or disclose all of the elements of any of Applicant's independent claims, Applicant submits that a *prima facie* case of obviousness has not been made. Therefore, Applicant submits that independent claims 1, 11, and 16 are allowable. Each of dependent claims 2-9 and 17-18 depends from, and thus incorporates all of the limitations of, one of these independent claims. Thus, for at least the same reason, claims 2-9 and 17-18 are also allowable.

**b. No motivation to combine**

According to M.P.E.P. § 2143, in order to establish the required *prima facie* case of obviousness of a claimed invention by applying a combination of references, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. See M.P.E.P. § 2143.

In addition, "a statement that modifications of the prior art to meet the claimed invention would have been 'well within the ordinary skill of the art at the time the claimed invention was made' because the references relied upon teach that all aspects of the claimed invention were individually known in the art is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references." See M.P.E.P. § 2143.01 (emphasis added).

On pages 2-3, the Office Action asserted that it would have been "obvious to one of ordinary skill in the art at the time the invention was made to have modified the device of Ott with the teachings of Kawamoto such that positioning IC1 and IC2 on a semiconductor substrate would decrease the size of the device."

As noted above, Ott is directed to two sensor elements, both of which are which are "made separately by different production processes, [to] make effective production possible". See Ott at column 5, lines 51-52. Applicants submit that the Office Action has not cited to any portion in Ott that discloses or suggests a discussion of "positioning IC1 and IC2 on a semiconductor substrate [that] would *decrease the size of the device*." See Office Action mailed

July 11, 2006 at page 3. (Emphasis added.) Further, Applicants submit that the Office Action has not cited to any portion in Kawamoto that discusses or suggests positioning two sensor elements such that the size of the device can decreased. Indeed, if making an improvement to the cited art were all that were necessary to justify combining disparate elements of the cited art, then no combination of elements resulting in an improved system would be patentable. Thus, Applicants respectfully submit that the Office Action has not provided any objective reasoning for combining Ott and Kawomoto.

For the above reasons, Applicants submit that the pending claims are in condition for allowance, and such action is respectfully requested.

#### 5. Response to Rejection of Claim 10

As noted above, in the Office Action mailed July 11, 2006, the Examiner rejected claim 10 (now incorporated into independent claims 1, 11, and 16) as being allegedly unpatentable over Ott, in view of Kawamoto, and further in view of Applicants' "admitted prior art." Claim 10 depends from, and thus incorporates all of the limitations of, independent claim 1. Thus, Applicants will use independent claim 1 as a basis for responding to the Office Action's rejection of claim 1.

For convenience, Applicants use the Office Action's phrase "admitted prior art". However, Applicants object to the use of the phrase "admitted prior art" because Applicants make no admissions that anything is "prior art", as the term is typically understood for patent examination purposes.

Under M.P.E.P. § 2143, in order to establish a *prima facie* case of obviousness of a claim over a combination of references, the Office Action must establish that the combination discloses or suggests every element recited in the claim. Applicants respectfully traverse the obviousness

rejection of these claims since the Office Action has not established that the combination of Ott, Kawamoto, and the "admitted prior art" teaches every element of independent claim 1. In particular, the Office Action has not established that the combination of Ott, Kawamoto, and "admitted prior art" teaches a 360-degree rotary position sensor system using a magnetoresistive linear sensor and a magnetoresistive angular sensor, in which both sensors are formed on a semiconductor substrate.

As noted above, the combination of Ott and Kawamoto fails to teach Applicants' presently claimed invention of a 360-degree rotary position sensor system using a magnetoresistive angular sensor and a magnetoresistive linear sensor in which the sensors are formed on a semiconductor substrate. On page 6, however, the Office Action stated that Applicants' "admitted prior art" discloses that "it is well known to use magneto resistive sensors as linear sensor (page 2, line 16) and angular sensors (page 3, line 4)." See Office Action at page 6.

In both of these portions (page 2, line 16 and page 3, line 4 in Applicants' specification), Applicants provide different examples of MR (magnetoresistive) sensors. On page 2, lines 16, Applicants' specification states "[a] magnetic linear sensor is one example of the MR sensor." And on page 3, line 4, Applicants' specification states "[a] magnetic angular sensor is another example of an MR sensor."

These two portions, as cited in the Office Action, merely provide different examples of MR sensors. Applicants submit that there is no discussion in the "Background" section of Applicants' specification of Applicants' currently claimed 360-degree magnetoresistive rotary position sensor system that uses a magnetoresistive linear sensor and a magnetoresistive angular sensor, in which both sensors are formed on a semiconductor substrate. In fact, Applicants'

specification on page 3, under the section titled "Background", explains that "[i]n addition to the linear sensor and angular sensor, MR sensors that are capable of detecting 360-degrees of rotation are *desirable*." (Emphasis added.)

In this regard, the Office Action has not cited to any portion in Ott, Kawamoto and/or the "admitted prior art" that teaches a 360-degree magnetoresistive rotary position sensor system that uses a magnetoresistive linear sensor and a magnetoresistive angular sensor, in which the sensors are formed on a semiconductor substrate.

For the above reasons, Applicants submit that the pending claims are in condition for allowance, and such action is respectfully requested.

#### 6. Conclusion

In view of the foregoing, Applicants submit that claims 1-10, 11, and 16-18 are allowable, and thus Applicants respectfully request favorable reconsideration and allowance of these claims. Should the Examiner wish to discuss this case with the undersigned, the Examiner is invited to call the undersigned at (312) 913-3351.

Respectfully submitted,

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